Attorney Docket # 4136-212 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of
Francis Edward FISHER et al.
Serial No.: 09/939,356
Filed: August 24, 2001
For: Heat Sink

Examiner: Leo, L. R.
Group Art: 3743

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APPEAL BRIEF

SIR:

This Appeal Brief is filed in compliance with 37 C.F.R. §1.192, and further to the Notice of Appeal filed on December 5, 2003. Three (3) copies of this Appeal Brief are enclosed.

The fee of $330.00 for filing an Appeal Brief (Large Entity) pursuant to 37 C.F.R. §1.17(f) is submitted herewith. Any additional fees or charges in connection with the above-identified captioned application may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

REAL PARTY IN INTEREST

By virtue of assignment recorded on August 24, 2001, at reel no. 012121, frame no. 0156, this application has been assigned to Aavid Thermalloy LLC, which is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no other appeals and/or interferences related to the above-identified application at the present time.

STATUS OF CLAIMS

Claims 1 and 3-10 are pending in this application, and are the subject of this appeal. The pending claims are presented in Appendix A. Claim 2 has been cancelled.

STATUS OF AMENDMENTS

There were no amendments filed after the final rejection.

SUMMARY OF THE INVENTION

The invention recited in claim 1 will now be explained with reference to the specification and Figures 1A and 1B.

The invention is a composite heat sink device for mounting to a printed circuit board. The composite heat sink includes a heat sink body (1) consisting essentially of *aluminum*, the body comprising at least two *mounting lands* (4) with respective substantially planar bottom surfaces which are coplanar, and at least two discrete thermally conductive *solderable* elements (5) *mechanically fixed* to respective mounting lands (4). Each solderable element has a first planar surface which is *contiguous* with a respective planar bottom surface of the heat sink body, and an

opposed planar second surface for soldering to the circuit board. The first and second planar surfaces are substantially parallel to each other.

The meaning of the italicized terms are essential to the outcome of this appeal. In particular, the term "lands" was specifically chosen in lieu of a more general term such as "surfaces". As noted in the paragraph extending from page 7, line 22 to page 8, line 4, "The shape of the heat sink body may be relatively simple, involving a plurality of substantially parallel folds in alternate directions to provide a corrugated sheet where alternate folds provide potential land surfaces for surface mounting use, with heat dissipating fins extending obliquely away from such land surfaces. In use, the land surfaces conduct heat away from the surface mounting on the substrate via the solderable element(s) into the body for heat dissipation."

The American Heritage Dictionary defines "lands" as "(6.) The raised portion of a grooved surface" *The American Heritage Dictionary of the English Language*, ©1973, American Heritage Publishing Co., Inc. (relevant pages are attached as Appendix B). When considered in the context of the specification, it is clear that the lands either define separate surfaces or a single surface which is interrupted by a groove or channel. The term "lands" does not refer to a single uninterrupted surface. The lands facilitate mounting the heat sink so that it can straddle the device to be protected. This mounting and the improved heat dissipation resulting therefrom are discussed at page 8.

The requirement that the heat sink body be "aluminum" is also relevant for the invention. As explained in the application, "While aluminum is a good material for heat sinks, e.g. it is lighter and cheaper than copper or copper alloys, it is not readily soldered due to its oxide layer." (page 4, lines 11-12). "This problem is solved by the invention by providing a thermally conductive solderable element attached over the lands of the aluminum heat sink body" (page 9, lines 6-7).

Since the solderable elements cannot be soldered to the aluminum mounting lands, they are mechanically fixed. While "mechanically fixed" is not specifically defined in the specification, that term is clearly narrower than the term "fixed" and clearly does not include soldering. Suitable mechanical fixings are discussed in detail at page 6 and clearly do include an interference fit -- which may be achieved by swaging a spigot in a socket -- or riveting, in particular self riveting, which is achieved without discrete rivets, as recited in claims 9 and 10.

The term "contiguous" is defined by the American Heritage Dictionary as "(1.) sharing an edge or boundary; touching" (See Appendix B). This definition is consistent with the usage in Appellants' claim 1, because the first planar surface is "touching" the bottom surface of the heat sink without any intervening material such as solder or adhesive. The contiguous relationship is possible as a result of the mechanical fixing, and not only simplifies assembly but improves heat conduction between the heat sink body and the solderable elements which are soldered to the circuit board.

Claim 3 recites a heat dissipating fin (2) upstanding from each of the lands (4), and a bight connecting the fins (2) between the lands (4). The American Heritage Dictionary defines "bight" as "(1a.) a loop in a rope, and (2.) a bend or curve, especially in a shore line" (See Appendix B). Such a loop or bend is clearly shown connecting the upstanding fins (2) in Figure 1A. Claim 4 recites the bight having a planar section (3) which is parallel to the lands (4) and intended to be arranged over an electronic device on the circuit board. This is also clearly shown in Figure 1A. The location of a heat sink body 71 over a device 70 is shown in Figure 7.

The subject matter of claims 9 and 10 is depicted most clearly in Figure 1B. Claim 9 recites that each element (5) is mechanically fixed to a respective land (4) by providing at least one projection (6) on each land, providing at least one socket (7) in each element, and inserting each projection (6) into a socket (7) in an interference fit. Claim 9 recites that the element (5) is swaged

onto the land (4). The American Heritage Dictionary defines "swage" (tr.v.) as "(to bend or shape by using a swage", and "swage" (n.) as "(1.) A tool used in bending or shaping cold metal." (See Appendix B). Since claim 10 must be interpreted as narrowing claim 9, it should be clear that "swage" refers to increasing the interference fit by bending or shaping. This is confirmed in the detailed description at page 13, lines 10-15.

ISSUES

The issues presented for review are:

(1) Whether claims 1 and 8 are anticipated by Bollesen U.S. 6,125,037;

(2) Whether claims 1, 5, and 8 are anticipated by Villaume U.S. 5,285,350;

(3) Whether claims 1, 3-5, and 8 are anticipated by Takahashi U.S. 5,528,456;

(4) Whether claims 1, 3-5, and 8 are anticipated by Pavlovic U.S. 6,055,158;

(5) Whether claims 1 and 8 are anticipated by Katsui U.S. 5,689,404;

(6) Whether claims 6-7 are obvious over Villaume, Katsui, Pavlovic, or Bollesen in view of Rosenbaum U.S. 2,965,819;

(7) Whether claims 9 and 10 are obvious over Villaume, Takahashi, Katsui, or Pavlovic in view of Pei et al. U.S. 6,230,789.

GROUPING OF CLAIMS

Claims 1-8 will stand or fall together.

Claim 9 is separately patentable, and will be argued separately.

Claim 10 is separately patentable, and will be argued separately.

ARGUMENT

Claims 1 And 8 Are Not Anticipated By Bollesen U.S. 6,125,037.

Bollesen discloses a heat sink 112 having a base 115 with an uninterrupted planar bottom surface, upstanding fins 114, and torque bars 140 extending oppositely from the bottom surface. In one embodiment, a thermal pad 116 made of an elastomer is bonded to the bottom surface by an adhesive. IC packages 104 are mounted on a circuit board 102 and held against the thermal pad 116 by a retainer 118. In another embodiment, a thermal pad 116 is not used and heat sink 112 directly contacts the IC packages 104.

Bollesen does not disclose at least two mounting lands with respective substantially planar bottom surfaces. Rather, it discloses a single planar surface with areas which are brought into contact with IC's. The Examiner apparently reads these areas as forming lands, but this ignores the definition of "land" mentioned above.

The language of a claim defines the boundary of its scope. Accordingly, the claim construction inquiry begins and ends in all cases with the actual words of the claim. Teleflex, Inc. v. Ficosa N. Am. Corp., 63 USPQ 2d 1374 (Fed. Cir. 2002). Claim terms must be construed as they would be by persons of ordinary skill in the art to which the invention pertains. Specialty Composites v. Cabot Corp., 6 USPQ 2d 1601 (Fed. Cir. 1988). The words used in a claim are interpreted in light of the intrinsic evidence of record, including the written description, the drawings, and the prosecution history. Teleflex, *supra.* Dictionaries, encyclopedias, and treatises

are reliable and objective sources of information for established meanings that would be attributed to claim terms by one skilled in the art, and thus are not "extrinsic evidence". Texas Digital Systems Inc. v. Telegenix, Inc., 64 USPQ 2d 1812 (Fed. Cir. 2002). In the absence of an express intent to impart a novel meaning to the claim terms, the words are presumed to take on the ordinary and customary meanings attributed to them by those of ordinary skill in the art. Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc., 67 USPQ 2d 1132 (Fed. Cir. 2003).

Appellants' claim 1 includes the term "at lest two mounting lands". The dictionary definition of "lands" is supported by the description and drawings of the application, which clearly show and describe discrete and separate surfaces for mounting the heat sink to a printed circuit board on either side of a device to be cooled. Since Bollesen does not disclose or suggest this feature, Bollesen does not constitute an anticipation of claim 1.

Further, the IC's 104 of Bollelsen are not directly fixed to the heat sink 112, but merely held against it by the retainer 118. This arrangement does not satisfy the "mechanically fixed" requirement of claim 1. The term "mechanically fixed", as defined by the examples given in Appellants' description and drawings, clearly contemplates a direct fixing of the solderable elements to the respective mounting lands. This is important because it permits handling of the heat sink with solderable elements as a single unit which can be mounted to a circuit board, straddling an IC mounted on the circuit board.

For the foregoing reasons it is clear that Bollesen does not anticipate claim 1 or Claim 8, which depends from claim 1.

Claims 1, 5, And 8 Are Not Anticipated By Villaume U.S. 5,285,350.

Villaume discloses a metal plate 20 which is formed with sides 12, 14 to which connectors 16 are attached at the ends. The surfaces 12, 14 are not coplanar with each other, neither surface constitutes a bottom surface, and neither surface alone constitutes two mounting lands. The connectors 16 (not numbered in the figures) each have a planar surface contiguous with a surface 12, 14, but do not have an opposed parallel surface for soldering to a circuit board. Rather, the connectors 16 are provided with pins received in holes in the circuit board. Unlike the thermally conductive solderable elements of the present invention, the connectors 16 of Villaume do not provide any substantial heat transfer function; this is provided by the semiconductors 50 themselves.

In his advisory action, the Examiner makes it clear for the first time that he considers the semiconductor devices 50 as constituting the discrete elements contacting the coplanar bottom surface 24 of the heat sink plate 20. He specifically avoids addressing the term "mounting lands", and once again runs afoul of the body of case law holding that the claim language defines the boundary of its scope. However, the bottom surface 24 of the plate 20 is a single surface which does not constitute two or more lands. It is interrupted by chimneys 30 to improve cooling, but is not interrupted by any groove or channel so as to provide discrete surfaces which could be mounted on either side of a device mounted on a circuit board. Further, the semiconductor devices 50 do not have planar surfaces which are "contiguous" with the bottom surface 24 of the plate 20. Rather, the devices 50 are attached to the surface 24 with double-sided heat conductive tape 52. Here, too, the Examiner has ignored a term used in the claim.

For the foregoing reasons it is clear that the Villaume patent does not constitute an anticipation of claim 1. Therefore, claims 5 and 8, which depend from claim 1 are also not anticipated by Villaume.

Claims 1, 3-5 And 8 Are Not Anticipated By Takahashi U.S. 5,528,456.

Figure 4B of Takahashi shows a thin metal plate which is pressed to form a corrugated structure constituting heat transfer foil 9, which in turn is soldered between circuit chips 1 and cap 7 by solder layers 10. Assuming that the bottoms of the V-profiles in the corrugated structure constitute Appellants' mounting lands, the Examiner apparently reads the chips 1 as thermally conductive solderable elements mechanically fixed to respective mounting lands and having top surfaces which are contiguous with the bottom surfaces of the lands. However, the chips 1 are not "mechanically fixed" to the mounting lands. According to Appellants' specification, "mechanically fixed" clearly does not mean soldered. In fact, Appellants teach away from the use of solder for the reason mentioned above, i.e. the aluminum heat sink body is not receptive to solder and, the present invention was developed to solve this problem. Further, the presence of the solder layer 10 in Takahashi prevents the surfaces of the circuit chips 1 from being "contiguous" with the bottom surfaces of the corrugated structure 9. Accordingly, Takahashi does not anticipate claim 1 and, thus, cannot anticipate claims 3-5 and 8 depending therefrom.

Claims 1, 3-5 And 8 Are Not Anticipated By Pavlovic U.S. 6,055,158.

Figures 3 and 4 of Pavlovic disclose a lid 24 comprising a polymeric frame 30 in which heat transfer members 32 are embedded. The embodiment of Figure 3 shows upstanding fins 42, center sections 38, legs 44, and feet 46 which the Examiner reads as mounting lands. When the lid 24 is fitted to base 22 in which electronic components 18 are mounted on a circuit member 16, the feet 46 are attached to the electronic components 18 by thermally conductive adhesive (see col. 3, lines 22-25). The Examiner reads the electronic components 18 as the discrete conductive solderable elements. However, the use of adhesive is not consistent with "mechanically fixed", as recited in Appellants' claim 1. The examples given in the specification - riveting and swaging - are

consistent with the use of a machine or tool to fix the devices to the lands. In this regard, it should be noted that the American Heritage Dictionary defines "mechanical" as "(1a) Of or pertaining to the use of machines or tools" (See Appendix B). Further, the use of an adhesive precludes the top surfaces of the components 18 from being "contiguous with" (touching) the bottom surfaces of the feet 46. One skilled in the art would not understand an adhesive applicator as a "tool" used to mechanically fix two elements together. The terms "mechanically fixed" and "contiguous" go hand-in-hand; the mechanical fixing provides for direct contact of the surfaces, which not only produces a simple assembly that can be soldered to a circuit board over an electronic component, but also provides for good internal heat transfer properties. Since Pavlovic meets neither of these limitations, Pavlovic cannot anticipate claim 1 or dependent claims 3-5 and 8.

Claims 1 And 8 Are Not Anticipated By Katsui U.S. 5,689,404.

Katsui discloses a heat sink comprising a base member 8 having an interrupted planar base surface BS, an opposite surface US having upstanding fins 12, and IC packages 4 and 6 bonded to the surface BS. In an alternative embodiment, shown in Figure 6, a copper member 54 is soldered to base member 56 by a solder layer 58, but there is no suggestion of discrete copper members mechanically fixed to the base surface to form mounting lands. Note that while the member 56 is aluminum, it must be provided with nickel plating to permit soldering to the copper 56.

As clarified in the Advisory Action, the Examiner reads the IC packages 4 and 6 as the discrete thermally conductive solderable elements. However this reference is distinguished as readily as the Bollesen patent discussed above, because it does not disclose at least two mounting lands having respective substantially planar bottom surfaces to which the IC's 4 and 6 are fixed. The single planar surface BS does not constitute "mounting lands" as that term would be understood

by one skilled in the art after consulting a dictionary and reading Appellants' specification. The Examiner's refusal to acknowledge this term as anything more than areas of a single uninterrupted surface runs afoul of the same case law as cited above in the discussion of Bolleson. When the claim is construed in accordance with the law, Katsui fails as an anticipation.

Claims 6 And 7 Are Not Obvious Over Any Of Villanume, Katsui, Pavlovic Or Bollesen In View Of Rosenbaum U.S. 2,965,819.

Rosenbaum is cited for its disclosure of an anodized heat sink body, but adds nothing to the primary references toward rendering claim 1 obvious. Accordingly, none of the cited combinations renders claims 6 or 7 obvious.

Claims 9 And 10 Are Not Obvious Over Villaume, Takahashi, Katsui, Or Pavlovic In View Of Pei et al. U.S. 6,230,789.

Pei et al. discloses a heat sink 10 made by bending an aluminum base plate to form bottoms 14 having coplanar surfaces provided with holes 42 which receive studs 24 upstanding from a plate 22; the studs 22 are deformed to retain the plate 22 to the bottoms 14. The Examiner states that it would have been obvious to employ in the primary references lands swaged to the elements for the purpose of achieving a strong joint as recognized by Pei et al. The flaw in this logic is that the "discrete thermally conductive solderable element" in each of the primary references is an integrated circuit package, not a metal plate formed with either studs or holes. The IC packages are delicate structures which could not withstand the forces involved in fitting a projection into a socket in an interference fit, as recited in claim 9. Even if the IC chips were somehow provided with projections or sockets, as recited in claim 9, the forces involved in swaging would surely destroy the chip. As such it would never occur to one skilled in the art to employ the interference fit recited in claim 9, much less the swaging recited in claim 10, to mechanically fix a

chip to a heat sink body, because it would destroy the chip and thereby inherently defeat the teachings of these primary references.

CONCLUSION

Only Appellants disclose and claim a structure which addresses the problem of soldering an aluminum heat sink body to a circuit board so that it can straddle a component fixed to the board, thereby providing heat dissipation for the component without being fixed to the component. This problem is not addressed by any of the prior art, which mitigates against a finding of obviousness based on any of the five primary references, because none of these references addresses this problem. The determination of whether a structure is or is not obvious requires cognizance of the properties of that structure and the problem which it solves, viewed in light of the teachings of the prior art. In re Wright, 6 USPQ2d 1959 (Fed. Cir. 1988).

The claims being definite and patentable over the art of record, reversal of the final rejection and early allowance are solicited.

Respectfully submitted,
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